

**OIL AND GAS
PIPELINES IN THE NORTH**
February 1974

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OIL AND GAS PIPELINES IN THE NORTH

The Arctic Institute of North America

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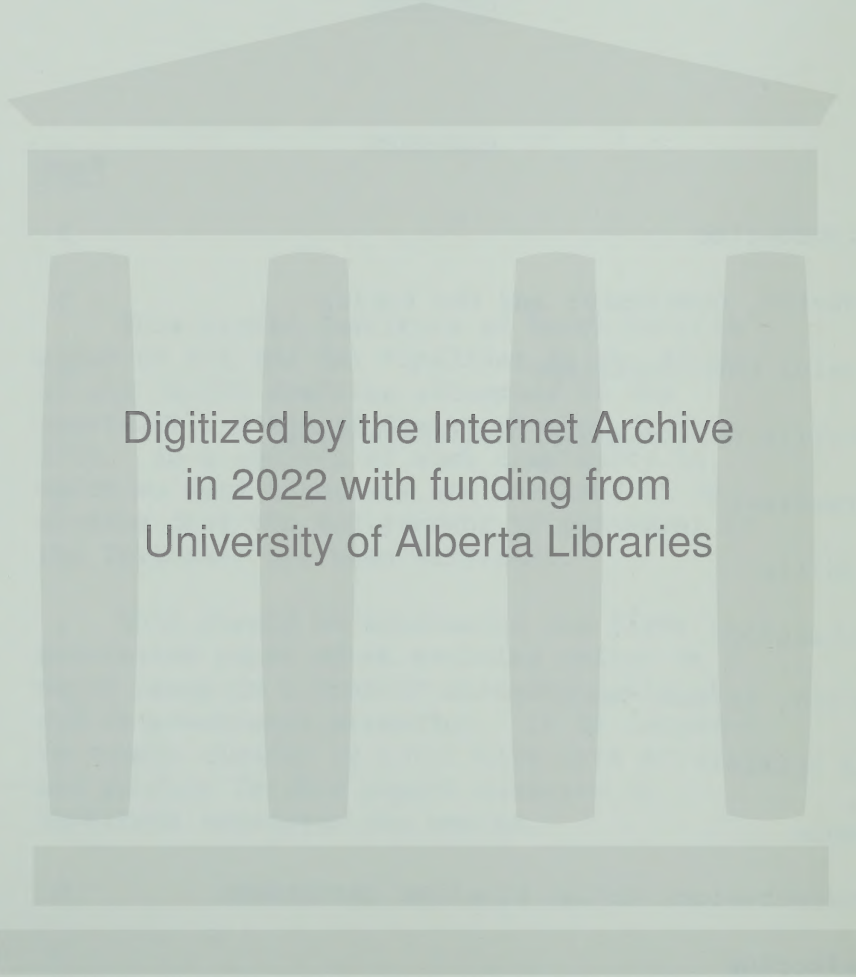
FOREWORD

This Arctic Institute of North America paper on Oil and Gas Pipelines in the North is the fourth drafting attempted by the Institute's Board of Governors since late 1972. In a subject of such complexity in which so many interests are involved it is obvious that the achievement of agreement by the Institute has been difficult.

This should be considered the first generation paper of an evolving policy on a major issue in a rapidly changing national and international situation. It is intended to remain closely in touch with this situation and produce further papers whenever an Institute consensus can emerge.

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OIL AND GAS PIPELINES IN THE NORTH

Introduction

The Arctic Institute has been working for more than a quarter of a century to promote the objective study of northern and arctic conditions and problems. One of the most pressing of these problems at the present time, namely the impact on the environment of oil and gas pipelines, has received much attention by the Institute, by governments, by industry, by conservationists and by the popular media in recent years. This statement puts on record the conclusions reached by the Institute on this question.

If any arctic petroleum resources are exploited there will be some use of pipelines, even if only for relatively small diameter gathering systems in the oil and gas fields themselves, and from collecting points to transshipment terminals. In all probability, however, some large diameter lines are to be anticipated as well. This statement deals with the effect such pipelines, large and small, will have on the environment of the North, including the human environment.

The statement does not advocate the construction of pipelines as opposed to other modes of transportation for arctic oil and gas. It does not attempt to argue for or against the exploitation of arctic oil and gas resources, nor does it deal with other or "down line" consequences of particular oil or gas pipeline proposals or marine tanker operations.

Industry, Government and the Public

It can be accepted that the engineering problems of pipeline constructions have been solved and that the pipelines can be built in arctic and northern regions. By making application for the requisite permits the companies concerned demonstrate that they are prepared to proceed as soon as permits are granted and, therefore, that they consider the economic risks involved are acceptable, including the possibility of having to restore the line to operating condition in the event of a breakdown and to clean up any oil spill. They also claim, in making application, that their proposals will meet the requirements established by the appropriate governmental authorities for protection of the environment. It may be assumed that such statements are not made lightly since industry will bear the financial burden and also great public criticism, loss of confidence and probable loss of business in future, if they are wrong.

On the other hand, governments and the public need to be equally confident that the net benefit to the public favours construction of the pipeline. Until recent times society has been prepared to accept that the responsible government agencies were adequate watchdogs of the public interest. This is much less true today and governments now accept the need for public participation in the review process.

Environmental issues that involve the public ultimately become matters for political decision with a balance to be made between exploitation with consequent deterioration of the environment to some accepted degree on the one hand and the benefits to the public, small or large, that will accrue on the other.

The Arctic Institute is directly concerned with both sides of this equation, with benefits, and environmental consequences, but perhaps most directly with the degree of environmental disturbance that will follow from pipeline construction and operation and hence with the method of monitoring the construction and maintenance of pipelines once permits for construction have been granted.

General Considerations

Some of the requirements of orderly development of the North, which are now immediately applicable to pipeline development, are as follows:-

- (a) Coherent, long-term, national energy policies which define the balance to be maintained between reserves, future domestic requirements and import/export considerations.
- (b) National land use policies which incorporate the wisest classification based on social, economic, and environmental grounds. Such policies will be key factors in development plans and need to be flexible over the long term to allow for changing needs and aspirations and the continuing accumulation of new knowledge.
- (c) The acceptance by industry of the full spirit of energy and land use policies and of the regulations implementing those policies, rather than just minimum compliance.
- (d) A cost-benefit analysis of each specific project. It is necessary to reconcile the divergent interests of economic development, preservation of environmental and aesthetic values, cultural values, recreation and renewable resources as perceived by particular groups and the public at large. Difficult as it is, means must be found to equate economic costs and benefits with the intangible components of the total environment. Without such analyses, it would be difficult if not impossible to arrive at decisions which are truly in the best public interest and which will be accepted generally as such.

Specific Environmental Considerations

It is recognized that there is a substantial difference in the engineering design of gas and oil pipelines principally because of the different operating pressures and temperatures. With the exception of the temperature regime, however, the differing engineering considerations make little if any difference in the effect of the pipeline on the environment. Since gas pipelines can be operated at temperatures equal to or below the ground temperatures, degradation of permafrost is much less of a problem than in the case of hot oil pipelines. For best pumping efficiency and overall economy oil pipelines must operate hot and therefore pose serious problems in permafrost areas and may also adversely affect biological life in the immediate vicinity. If hot pipelines are elevated over long distances in order to overcome the hazard of permafrost degradation, they may then create more difficult wildlife problems with some wildlife than would be buried line and they would be more unsightly.

Thus oil pipelines and gas pipelines involve some different engineering design problems. However, neither should be permitted to exceed defined limits in the disturbance that is to be accepted. Land use regulations and standards should be uniform for both.

Permafrost

Early Arctic oil pipeline designs failed to deal adequately with the problem of permafrost in areas where the soil has a very high water content. When examined these designs caused alarm; it is probable that if built as originally designed very extensive damage would have been caused and the pipeline itself would have been destroyed or at least rendered inoperable by permafrost degradation.

On the other hand engineers have very extensive knowledge of permafrost and have been dealing with it successfully for many years. It is also true that natural degradation of permafrost results from wave action along shore lines, from river bank erosion, landslides, natural forest fires and so on. Natural processes eventually bring stabilization and restoration. Along the northern stretches of the Alaska Highway permafrost degradation was induced in places during initial construction and continued on a minor scale for several years. Stability was achieved and no extensive damage from this cause is evident today. When permafrost is understood engineering design can provide for it. When degradation is induced by error or accident a combination of natural stabilizing and restoration action and corrective engineering can prevent widespread destruction.

The Arctic Institute considers that to be adequate, the design of Arctic pipelines must guarantee that no long-term disruption of the permafrost regime will result from pipeline installation and operation. It is recognized that minor localized melting cannot be avoided altogether during construction. This can be dealt with by remedial action at the time and an important feature of the construction plan will be provision to recognize and deal with such hazards promptly. Permafrost hazards from hot oil spills are dealt with under "Oil Spills". If it is necessary, in order to guarantee freedom from long-term degradation of permafrost, to elevate the pipe involving high cost for insulation and other protection, or to adopt other expensive methods, such costs must be accepted.

Wildlife

The Arctic Institute considers that pipeline routes and pipeline design must ensure against significant interference with migration patterns, breeding grounds and feeding grounds of all wildlife, mammals, birds and fish. The word "significant" is used rather than "any" because some interference is inevitable during the construction phase of a pipeline particularly with small mammals and fish; some disturbance of the natural stable conditions of ground or stream bottom cannot be prevented. In any case, small changes are occurring all the time. Until sufficient research has been conducted to establish absolute criteria for wildlife protection, pipeline planning and design should be monitored by wildlife specialists and adjusted to meet their requirements and pipeline construction should be under observation by wildlife specialists to ensure that local construction work is carried on with minimum disturbance to wildlife.

Archaeology

Archaeological sites, known or potential, should be protected in pipeline route selection. Most archaeological work can be completed before construction and during preparation of the right-of-way. During actual construction observation by qualified archaeologists should be provided and on-site government inspectors acting upon expert advice should be empowered to dictate local route changes or temporary suspension of construction work or other essential measures to provide salvage or, in very rare cases, to ensure protection of a site. The archaeological survey performed by the Alyeska Pipeline Service Company with inspection and review by the Arctic Institute for the U.S. Department of the Interior, is a good example of such protection and again demonstrates that archaeological rescue work need not inhibit a development project. (1)

(1) "Archaeological Studies along the Proposed Trans-Alaska Pipeline Route" by John M. Campbell. AINA Technical Paper No. 26, November 1973.

Wastes, Refuse, Etc.

It should be mandatory that no substantial or permanent contamination of the soil, or of ground water, streams or lakes is acceptable. Although the areal extent of soil pollution may be negligible, the pollution of ground water from contaminated soils may be extensive and it is obvious that contamination of flowing water will have widespread effects. The cost of processing all refuse and wastes arising from construction activities including human wastes will not be excessive; such processing, plus removal of solids and site restoration should be mandatory. For permanent installations complete sewage treatment, and processing of other wastes should also be mandatory.

Oil Spills

Pipelines cannot be designed and built with absolute assurance against breaks and spills. This is particularly a problem in earthquake zones and in areas subject to other natural phenomena such as river bank erosion. Special design features will be necessary to minimize such risks and further measures must be taken to deal with breaks if they occur. These must be, in order of priority, to minimize the amount of oil which escapes, to contain the escaped oil and to destroy it or render it harmless. The difficulty of containing oil which can get into ground water or a running stream, and of destroying or otherwise rendering it harmless is obvious and merits intensive study. The "crash action" use of equipment, the creation of dykes and so on to deal with a spill may cause permafrost degradation, as would large-scale ponding of warm oil in such areas. Measures to minimize and eventually to restore this kind of damage should be incorporated in planning.

People

The most complex and sensitive concern relating to the construction and operation of pipelines in northern North America is the impact upon the resident population and particularly the native people. There are two prime requirements. First, a pipeline right-of-way and pipeline construction and long-term operation should not disrupt or make impossible the pursuit of the traditional subsistence economy of the native people for those who wish to continue it. Second, the northern resident of whatever ethnic background should be encouraged to participate in the construction and operating phases of pipelines in the North.

There is already in progress a high speed social and cultural change with the attendant range of social and psychological problems. This is the direct result of contact with whites from the South and elsewhere over a century or more. The process has been accelerated greatly in the last several decades with extensive defence activity during and after the Second World War and most recently with intensive petroleum exploration. The influx of large numbers of southerners for pipeline construction will create further strains. These may be mitigated by keeping construction camps well away from the existing communities and giving northern employees generous opportunities to return to their homes at frequent intervals.

It is inevitable that in the immediate vicinity of major engineering work, including pipelines, the ability of the native people to continue their traditional ways of living off and with the land will be altered, if not destroyed altogether. The final disposition of native claims and the actual allocation of land to native peoples in the North is of immediate importance. This has been started in Alaska with a land and financial settlement but the final stage of actual allocation of specific parcels of land is not complete. A settlement is needed in Canada also, not necessarily on the same lines; however, the specific right-of-way for a pipeline cannot be finally determined until the land tenure matter is finally decided. Only then can a route be chosen to cause minimum disturbance to or interference with the preferences of the people concerned. "The process of evolution is etched into the nature of man. The northern man is no exception and, in this regard, his integration into the mainstream of our society is not something he rejects They (the northern people) will in fact consider this (economic development of the North) as something neutral in terms of gains and losses for themselves, and assess its merits on the grounds of whether or not it will permit them to play a key role in their own evolution. In other words, almost any new undertaking related to the development of the North could theoretically represent gains for its inhabitants if they can consciously take part in it."(2)

The human environmental constraint is that the damage in terms of disruption and interference be minimized and the participation of northerners be maximized in the decision making process and in the implementation of pipeline projects in the North.

Considerations during Pipeline Operations

The foregoing constraints apply chiefly but not exclusively to the construction phase of pipelines. At the date of completion, problems of land tenure and use for other purposes will have been resolved, the onset of heavy construction equipment, of large numbers of workers and of massive transportation operations will be over. The principal concerns remaining will then be threefold, during the operating phase.

(2) Eric Gourdeau in a speech to the St. James Literary Society, Montreal, 12 January 1971.

Of great importance, although transitory rather than a permanent concern, will be to continue to encourage integration of northerners into operating crews at all levels, and vigilance to ensure against unwelcome interference in local communities. Second will be scientific and engineering assessment of the medium and long-term impact of each pipeline on the environment as a whole in order to provide guidance for the design and construction of future pipelines and for the evolution and refinement of land use regulations and environmental constraints. Finally, there must be continuous inspection for breaks and for pollution control and continuous readiness on the part of well-equipped and trained crews to deal with breaks, spills and any other hazards.

It is suggested that governments and the pipeline companies will be equally and fully involved in the second task of scientific and technical assessment. The first task and the third task of safety and anti-pollution control are the prime responsibility of the companies, with governments carrying out inspections and regulatory measures.

Monitoring

During the construction phase of any northern pipeline project the Arctic Institute envisages a three-tiered programme of inspection. The first will be by the pipeline proprietors who will in the normal course of events perform inspections to ensure adherence to specifications, proper workmanship and observance of land use regulations. Depending on the requirements of the government concerned, the proprietors also may be obligated to hire specialists to advise on certain land use stipulations as in the case of the archaeological reconnaissance on the route of the Alyeska pipeline.

The second tier will be by government, to ensure adherence to all stipulations applied when the permit is granted. This may be by government field inspectors or by contractors hired by the government or a combination of both.

The third tier should be a completely independent review group. It is envisaged that this would be financed by industry, or in some cases perhaps by both industry and government, but chosen by an independent body with no obligations or connections to either the companies or the government concerned. The group should be composed of individuals of recognized stature and should be backed up by a full-time staff. Its purpose would be to observe all aspects of the construction and to bring to light any procedure or activity or design feature which was likely to have an unacceptable impact on the total environment.

Such a third-level scrutiny is the means whereby the Arctic Institute believes the conflicting interests and concerns of industry, government and conservationists can be resolved in practice. The review group would not have executive powers; it would have a strong voice to call attention to potential dangers before it is too late to correct them.

After construction, industry and government would be involved in on-going research and inspections as envisaged above in "Considerations during Pipeline Operations". It is suggested that the independent review group should remain in being and observe the operation in the field on a decreasing frequency for an initial period of months or years. It might cease to function when it was fully satisfied as to the effectiveness and safety of the project and that reliable and effective measures to deal with all emergencies were provided on a continuing basis. Alternatively it might fill a continuing role in assessment of the impact, again as the impartial expert reviewer.

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